Muelleria

33: 75–83

Published online in advance of the print edition, 21 April 2015.

Notes on *Potentilla* (Rosaceae) and related genera in Australia

A.R. Bean

Queensland Herbarium, Brisbane Botanic Gardens, Mt Coot-tha Road, Toowong 4066, Queensland, Australia; e-mail: tony.bean@qld.gov.au

Abstract

Patentilla nanapetala A.R.Bean, a new endemic Australian species, is described, illustrated, and its distributian mapped. The name *Argentina anserina* (L.) Rydb. (farmerly *Potentilla anserina* L.) is accepted. *Potentilla crantzii* (Crantz) Beck ex Fritsch is remaved from the Australian flora; and the genus *Fragaria* L. reinstated for Australia. A key to the Australian *Patentilla* L., *Fragaria* and *Argentina* Hill is presented.

Key words: *Argentina, Fragaria*, new species, Australian flara, identificatian

Introduction

Potentilla L. is a large genus of about 490 species (Soják 2009), with its greatest species diversity in the temperate and boreal regions of the northern hemisphere. Molecular phylogenetic studies over the last decade or so have done much to clarify the relationships within *Potentilla*, allowing a more objective way of determining the status of the numerous satellite genera. *Argentina* Hill is one such genus of long standing, which was reinstated by Soják (2010), based on the convincing evidence of Dobeš and Paule (2010).

Australia has six species of *Potentilla* and a single *Argentina* species, and recent state floras and censuses (Harden & Rodd 1990; Barker et al. 2005; Walsh & Stajsic 2008) assign them all as alien to Australia.

In this paper, a *Potentilla* sp. from arid parts of eastern central Australia is shown to be distinct from any other named species, and is endemic (and therefore indigenous) to Australia. It is formally described here as *Potentilla nanopetala* A.R.Bean, and its distribution is mapped and illustrations are provided. *Potentilla anserina* L. is transferred to the recently reinstated genus *Argentina*, as *Argentina anserina* (L.) Rydb., and its origin status and taxonomic status are discussed. The Australian record of *Potentilla crantzii* (Crantz) Beck ex Fritsch is found to be erroneous, and that name is removed from the Australian flora. The genus *Fragaria* L. is reinstated on the basis of recent molecular studies.

A dichotomous key to all Australian native and naturalised taxa of *Potentilla, Fragaria* and *Argentina* is presented.

ISSN: 0077-1813 (print) · ISSN: 2204-2032 (online)

Materials and methods

This study is based on an examination of herbarium specimens from AD, BRI, CANB, MEL and NSW, including more than 60 specimens of *Potentilla supina* L., 50 specimens of *P. anserina* and one specimen of *P. heynii* Roth. In addition, several high-quality images of herbarium specimens of *P. heynii* have been examined, originating from the Museum National d' Histoire Naturelle (P). Images of type specimens of *P. supina* and *P. anserina* have been viewed. Measurements of petals, stamens and carpels are based on material preserved in spirit, or reconstituted with boiling water; all other measurements were made from dried herbarium specimens. *Potentilla nanopetala* has been examined in the field by the author.

Taxonomy

Potentilla nanopetala A.R.Bean, **sp. nov.**

Type: **SOUTH AUSTRALIA.** Burlieburlie Waterhole off the Strzelecki Track, S of Innamincka, 27° 48'S 140° 43'E, 23 October 2007, *T.S. Te 205, D.J. Duval, P.J. Lang & M.J. Thorpe* (holo: AD 213898; iso: K, *n.v.*).

With affinity to *P. heynii*, but differing by the terminal leaflet and lateral leaflets not deeply incised, the stem indumentum with two classes of hairs, the often shorter fruiting pedicels, and the consistently and conspicuously ribbed achenes.

[*P. supina auct. non* L.; Jacobs & Pickard (1981), Harden & Rodd (1990), Barker et al. (2005), APC (2014)]

Decumbent, suberect or erect annual herb to 20 cm high and 30 cm across, runners absent. Leaf rosettes absent from fertile plants. *Stems* and petioles terete, with two distinct indumentum types; pilose hairs, moderately dense to dense, spreading, seemingly unicellular, cylindrical in transverse section, 0.5–1.4 mm long; and curved to flexuose hairs, uniseriate, 2–5-celled, segments flattened, each segment at right angles to the adjacent one, 0.15–0.4 mm long. *Leaves* all ternate (some plants), or mostly ternate, with some of the lower leaves pinnate, with 5 leaflets (some plants); stipules adnate to base of petiole, oblong to elliptical, 2.0–3.5 mm long, 0.8–1.0 mm wide, green, pilose throughout, margins entire, apex obtuse. Petioles 3.5–18 mm long, the longer ones towards the base of the plant; lamina 5.0–14.0 mm long; terminal leaflet broadly obovate, 4.5–9.0 mm long, shortly petiolulate, with 7–9 obtuse lobes, incised about halfway to midrib; lateral leaflets opposite or slightly disjunct, obovate, 2.5–6.0 mm long, sessile, with 3–6 obtuse lobes incised about halfway to midrib; petioles and leaves with numerous unicellular pilose hairs on both surfaces, multicellular hairs absent. *Flowers* axillary, solitary, 3.2–5.0 mm diameter, 5-merous; pedicels 1.3–2.1 mm long. *Epicalyx* segments elliptical, 1.3–2.5 mm long, 0.5–0.9 mm wide, slightly shorter than sepals, with numerous antrorse unicellular hairs on both surfaces, margins entire, apex obtuse; *sepals* triangular, 1.6–3.0 mm long, 1.3–1.5 mm wide at base, with numerous antrorse unicellular hairs on outer surface, apex acute. *Petals* elliptical to spathulate, 1.0–1.2 mm long, 0.5–0.6 mm wide, much shorter than sepals, glabrous, yellow, apex obtuse. *Stamens* 14–16 in two whorls; anthers basifixed, 2-locular, 0.15–0.2 mm long; shorter filaments 0.25–0.4 mm long, longer filaments 0.6–0.7 mm long; staminal filaments surrounded by erect, dense, transparent, unicellular hairs, c. 0.6 mm long. *Carpels* glabrous, c. 50 per flower; torus subglobose, glabrous or with scattered patent hairs. *Style* slender, subterminal, sparsely glandular, 0.3–0.5 mm long, width uniform for much of its length, but tapering near the apex. *Fruit* enclosed by epicalyx and sepals; fruiting pedicels erect, 1.8–7 mm long; achenes 0.6–0.7 mm long, 0.45–0.5 mm diameter, ovoid, pale brown to black, glabrous, with a few conspicuous longitudinal ribs. (Fig. 1)

Specimens examined: **NEW SOUTH WALES.** Billabong of Darling River, 10 km SW of Wilcannia, 31° 38'S 143° 18'E, 16.v.1979, *K. Paijmans 2766* (CANB); Billabong of Darling River, 10 km SW of Wilcannia, 31° 38'S 143° 18'E, 8.vi.1979, *K. Paijmans 2809* (CANB, NSW); Narran Lakes Nature Reserve, c. 71 km by road ENE of Brewarrina, 29° 41'S 147° 27'E, 15.ix.2004, *A.R. Bean 22942* (BRI, NSW); On edge of Cavendilla Creek, WSW of picnic area, Kinchega N.P., 32° 24'S 142° 14'E, 20.iii.1997, *A.D. Auld 410* (NSW). **SOUTH AUSTRALIA.** Near King's grave (S of the Cooper), 27° 45'S 140° 44'E, 8.vii.1997, *R. Bates 47341* (AD); Near King's grave (S of the Cooper), 27° 45'S 140° 44'E, 8.vii.1997, *R. Bates 47347* (AD).

Distribution and habitat: *Potentilla nanopetala* is known from near Innamincka in the far north-east of South Australia, and in north-western New South Wales (Fig. 2). It is not recorded from Queensland, but as the South Australian records are just 30 km from the border, it is highly likely that it will be found there. At most sites it is recorded from edges of billabongs, with associated

Figure 1. *Potentilla nanopetala*. **A.** whole plant (×0.6); **B.** stem indumentum (×32); **C.** a lower leaf and stipule (×6); **D.** oblique view of flower (×12); **E.** petal (×24); **F.** calyx, epicalyx and stamens (×8); **G.** mature achene, with attached style (×32). (**A–C, E–G** from *Bean 22942*, BRI; **D.** from *Te 205 et al.*, AD).

indigenous herbaceous genera including *Calotis* R.Br., *Glinus* L., *Centipeda* Lour., *Alternanthera* Forssk. and *Heliotropium* L. At Narran Lake Nature Reserve (New South Wales), it grows in the 'Chenopod Low Open shrubland & ephemeral herbfield' (McGann et al. 2001) on the margins of the lake.

Phenology: Flowers and fruits are recorded for March, May, June, July and September, but it probably would flower and fruit at any time of year when there is sufficient soil moisture.

Conservation status: Data deficient (IUCN 2012). This is a small plant, very ephemeral in nature, with inconspicuous flowers, and growing in places not often visited by botanists. While only a few collections are known, it is likely that the species is present in alluvial habitats throughout its known geographical range.

Etymology: From the Greek *nanos* (a dwarf), and *petalon* (petal), in reference to the very small petals in this species.

Notes: The first specimens of *Potentilla nanopetala*, collected in 1979, were identified as the Asian and European species *P. supina* in Jacobs and Pickard (1981), and that name has been used in Australian state floras and censuses since then.

Potentilla nanopetala keys readily to *P. supina* in *Flora Europaea* (Ball et al. 1968) if the 'Leaves pinnate' lead is followed, because it has yellow petals, solitary flowers in the leaf axils, and petals shorter than sepals. However, if the 'Leaves ternate or digitate' lead is followed, *P. nanopetala* keys with difficulty to *P. norvegica* L. In the *Flora of Turkey* (Pesman 1972), *P. nanopetala* will key to *P. supina*, except that the stated '5–11 leaflets' does not fit it. It does not key to *P. supina* in Soják (2012), because it has fewer leaflets than *P. supina; P. supina* appears there only in 'Key E', and that key is diagnosed by 'at least some leaves with three or more pairs of leaflets'.

Potentilla nanopetala differs from *P. supina* by the 3 (rarely 5) leaflets (5–11 leaflets for *P. supina*); the pedicels 1.3–2.1 mm long in flowering material (3–12 mm long

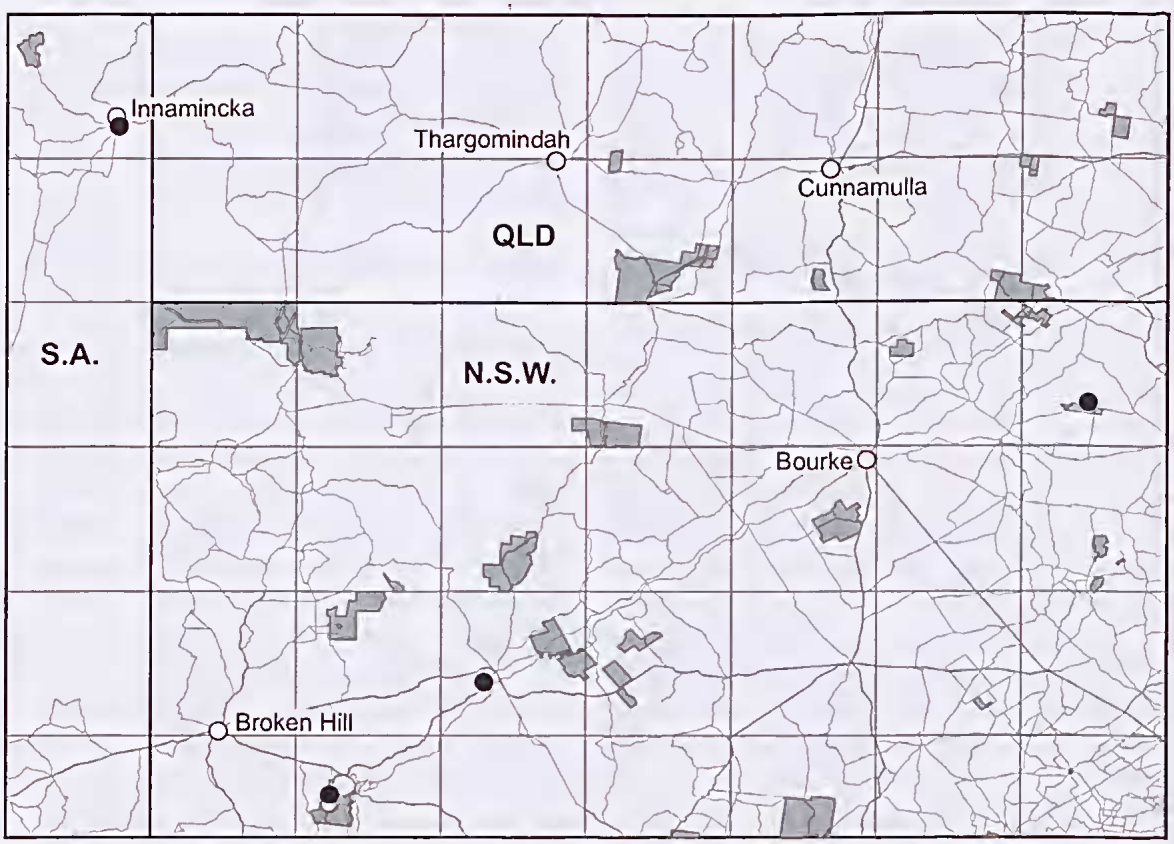

Figure 2. Distribution of *Potentilla nanopetala* (closed circles)

for *P. supina*); the pedicels 1.8–7 mm long in fruiting material (5–18 mm long for *P. supina*); the elliptical to spathulate petals 1.0–1.2 mm long with obtuse apex (broadly obovate petals 2–3 mm long with emarginate apex for *P. supina*); and the epicalyx segments shorter than sepals (equal to or longer than sepals for *P. supina*).

Potentilla heynii Roth is a species related to both *P. supina* and *P. nanopetala*. It had often been included with *P. supina*, until it was resurrected by Soják (1988). Its synonyms include *P. amurensis* Maxim. and *P. parvipetala* B.C.Ding & S.Y.Wang (Soják 2009). I believe that *P. obovata* Bertol. is a synonym of *P. supina*, as given in The Plant List (2013), and not a synonym of *P. heynii*, as determined by Soják on the syntype at K (Kew Catalogue 2015). *Potentilla heynii* ranges from northern India to Korea (Soják 1988), and closely resembles *P. nanopetala* in that its petals are the same size and shape, and the flowers are axillary.

Potentilla heynii and *P. nanopetala* can be distinguished by the morphology of the leaves, the stem indumentum, the pedicel length, and achene morphology. Some plants of *P. heynii* can have ternate leaves throughout, but then the terminal leaflet is trisect, and the lateral leaflets are bisected almost to the midrib (Soják 1988; Soják 2004; Soják 2007). The lowermost stem leaves of *P. heynii* are either palmate with five leaflets from which the middle one is trisect, or pinnate with two or three pairs of leaflets (Soják 1988). In *P. nanopetala*, the leaves are all ternate on some plants, while other plants have leaves predominantly ternate, but some pinnate leaves (with 5 leaflets) are present on the lower part of the plant; the terminal leaflet usually has 7–9 more or less equal lobes that are divided about halfway to the midrib (rarely more). Similarly, the lateral leaflets are not deeply bisected, but have 3–6 shallow obtuse lobes. The lower stem leaves of *P. nanopetala* are either ternate with the terminal leaflet shallowly lobed, or pinnate with 2 pairs of leaflets, where the lateral leaflets are not bisected.

Potentilla nanopetala has two distinct indumentum types on the stems and petioles: a) pilose, unicellular, cylindrical hairs, and b) shorter 2–5-celled hairs with flattened segments. *Potentilla heynii* has only pilose, unicellular, cylindrical hairs; it completely lacks the 2–5-celled hairs with flattened segments.

Some of the achenes of *P. heynii* are 0.6–0.7 mm long, smooth or with minute ribs, while other achenes are 0.7–0.9 mm long with strong ribs (Soják 1988). In *P. nanopetala*, all achenes are 0.6–0.7 mm long, and all have conspicuous ribs.

A specimen of *P. heynii* has been examined by the author (AD98148115), confirming its markedly different leaf morphology and indumentum as compared to *P. nanopetala* (outlined above). The fruiting pedicels of this specimen are 7.5–9.5 mm long (1.8–7 mm long for *P. nanopetala*); the achenes are 0.6–0.65 mm long, and smooth (conspicuously ribbed for *P. nanopetala*). Online specimen images of *P. heynii* (specimens from P), determined by *Potentilla* specialist Jiri Soják, also confirm the differences in the leaf morphology and indumentum already alluded to. The fruiting pedicels on these specimens are 5–10 mm long.

Potentilla heynii is treated in the *Flora of China* (Chaoluan et al. 2003) under the name *P. supina* var. *ternata* Petermann, which according to Soják (2007), is a misapplied name. Chaoluan et al. (2003) stated that *P. supina* var. *ternata* has the margin of the central leaflet '2 or 3-parted'. This is in accordance with Soják (1988, 2004, 2007), but differs strongly from *P. nanopetala* where the leaflet margin bears numerous lobes that are not deeply incised.

Fedorov et al. (1971) described *Potentilla amurensis* Maxim., which is a synonym of *P. heynii* (Soják 2009). They described the terminal leaflet as 'deeply 3-partite', and the lateral leaflets '2-partite with an oblique base and spreading or declinate lobes (leaves often appearing quinate)'.

Potentilla nanopetala will key to *P. norvegica* in *Flora Europaea* (Ball et al. 1968). *Potentilla norvegica* differs from *P. nanopetala* by the leaflets 10–70 mm long (2.5–9 mm long for *P. nanopetala*), sepals c. 10 mm long in fruit (1.6–3.0 mm long for *P. nanopetala*), and petals 4–5 mm long (1.0–1.2 mm long for *P. nanopetala*).

Another similar species is *P. centigrana* Maxim., which keys out next to *P. supina* in Chaoluan et al. (2003). *Potentilla centigrana* differs from *P. nanopetala* by its serrated stipules; pedicels glabrous or subglabrous, 5–20 mm long; styles with a thickened base; and the smooth achenes c. 1 mm diameter.

The recognition of *P. nanopetala*, an endemic southern hemisphere species, previously misidentified as a northern hemisphere species (*P. supina*), is not without parallel. Castagnaro et al. (1998) described

P. tucumanensis A.Castagnaro & M.Arias, a species endemic to northern Argentina. It had, since 1900, been identified as *P. norvegica*, a European species.

Potentilla nanopetala is here regarded as an indigenous and endemic Australian species. A label attached to one of the herbarium specimens of *P. nanopetala* (*Bates 47347*) says 'The ephemeral Aust[ralian] desert plants are probably an endemic form, R. Bates, Dec 98'. It meets a majority of the ecological criteria of Bean (2007); it is not persistently invasive; geographical discontinuities are related to soil type and habitat, rather than human settlement patterns; it consistently occurs in intact unmodified habitat – no human disturbance is noted on any of the specimen labels, nor are any weeds listed. At the site visited by the present author, the habitat was absolutely weed free and there was no evident human disturbance.

Potentilla crantzii (Crantz) Beck ex Fritsch

This species is recorded as being naturalised in South Australia (APC 2014). This record is based on a single specimen at AD (*Bates 27409*). However, my examination of this specimen revealed that it was misidentified. The specimen is in fact *Potentilla argentea* L. Therefore, the name *P. crantzii* can be removed from Australian flora lists.

Argentina Hill, *Brit. Herb. (Hill)* 6 (1756)

Type: *A. vulgaris* Hill

Potentilla sect. *Pentaphylloides* Tausch, *Hort. Canal.* 1: sub *P. ornithopoda* (1823). *Type: P. fruticosa* L.

Argentina was described by Hill in 1756, for the species that Linnaeus described as *Potentilla anserina*. Rydberg (1908) accepted the genus as distinct and described several species of *Argentina* and transferred a few species from *Potentilla*, but for the last century the genus has been included in synonymy with *Potentilla*. A molecular phylogenetic study by Eriksson et al. (2003) showed that *P. anserina* and a few other species formed a separate clade from all other *Potentilla* species, but was based on limited taxon sampling. The more comprehensive sampling of Dobeš and Paule (2010) has reinforced the distinctiveness of the *Argentina*-clade, and they recommended the acceptance of *Argentina* as a distinct genus. Soják (2010) made the required combinations.

Argentina comprises 64 species, mainly in the Himalayan region of Asia and in alpine New Guinea. There is one species in Australia, and one species in New Zealand.

Argentina anserina (L.) Rydb., *Mem. Dept. Bot. Columbia Coll.* 2: 159 (1898)

Potentilla anserina L., *Sp. Pl.* 1: 495 (1753).

Type: Lectotype: Herb. Clifford: 193, *Potentilla* 1 (BM-000628646), *fide* Rousi in *Ann. Bot. Fenn.* 2 : 101 (1965).

Distribution and habitat: In Australia, *Argentina anserina* occurs in Tasmania, southern Victoria, southern New South Wales, and south-eastern South Australia. According to Barker et al. (2005), *Potentilla anserina* is extinct in the 'Southern Lofty' region of South Australia, judging by available herbarium specimens, with the most recent collections being in the 1880s. It has not been collected in New South Wales since 1959 (AVH 2014). It is apparently stable in Victoria and Tasmania, as there are some recent collections from those states. There is a single record on Australia's Virtual Herbarium (AVH 2014) from the far south-west of Western Australia, but that record is erroneous, the result of a misidentification. The specimen involved (*W.R. Barker 2317*) is in fact *Hibbertia grossulariifolia* (Salisb.) Salisb.

Notes: Soják (1994) published a key to *Potentilla* sect. *Pentaphylloides* Tausch, as a precursor to an intended revision of the group. However, that revision did not occur. The key included a few *nomina nuda* for taxa he intended to describe or combinations that he intended to make, including *P. anserina* subsp. *australiensis* Soják nom. inval., for the form of *Potentilla anserina* (=*Argentina anserina*) that occurs in Australia. The differences cited by Soják for subsp. *australiensis* (erect hairs on the petioles, and carpels usually hairy) are not consistent and Soják later stated (in litt., MEL596484) that he did not proceed with the naming of the subspecies after having seen additional Australian material.

Argentina anserina (as *Potentilla anserina*) has been regarded as an alien species in Australia (Jeanes & Jobson 1996; Barker et al. 2005; Walsh & Stajsic 2008; Baker & de Salas 2012). However, it was collected by Robert Brown in 1804 from northern Tasmania (Bentham 1864), just months after the arrival there of European settlers, and its apparent diminution in the wild (based on the lack of recent herbarium collections

Key to the Australian native and naturalised taxa of *Argentina*, *Fragaria* and *Potentilla* (based on Australian material; naturalised taxa indicated by an asterisk)

1 Leaves with 9–20 leaflets ..... ***Argentina anserina***
1: Leaves with 3–7 leaflets **2**

2 All leaves with 3 leaflets, or some leaves pinnate with 5 leaflets **3**
2: All leaves digitate, and some leaves with 5–7 leaflets **6**

3 Leaflets 3(–5); lamina of terminal leaflet 4.5–9 mm long; ripe achenes pale brown to black; decumbent to erect herb without runners ..... ***Potentilla nanopetala***
3: Leaflets 3; lamina of terminal leaflet 10–65 mm long; ripe achenes red; trailing herbs with long runners **4**

4 Epicalyx segments 3–5-lobed; petals yellow; hairs on lower leaf surface confined to veins ..... ****Potentilla indica***
4: Epicalyx segments entire; petals white; hairs distributed all over lower leaf surface **5**

5 Achenes 1.2–1.3 mm long; petals 5–8 mm long; inflorescence branched only near apex ..... ****Fragaria vesca***
5: Achenes 1.3–1.5 mm long; petals 8–10 mm long; inflorescence branched from about half-way ..... ****Fragaria* × *ananassa***

6 Leaflets silvery on the underside ..... ****Potentilla argentea***
6: Leaflets green on the underside **7**

7 Plants erect; inflorescences terminal, cymose; leaflets 5–7 ..... ****Potentilla recta***
7: Plants decumbent; inflorescence axillary; leaflets 3–5 ..... **8**

8 Flowers mostly 4-merous, sometimes 5-merous; carpels 20–50 ..... ****Potentilla anglica***
8: Flowers all 5-merous; carpels 60–120 ..... ****Potentilla reptans***

from South Australia and New South Wales) suggests an indigenous plant species being outcompeted by weeds. The existence of the very similar *Argentina anserinoides* (Raoul) Holub (syn. *Potentilla anserinoides* Raoul), an endemic of New Zealand, suggests that progenitors arrived in Australasia without the aid of man. As I have no field knowledge of *A. anserina* in Australia, I am unable to assess most of the ecological criteria of Bean (2007). The phytogeographical criteria present somewhat of a contradiction; on the one hand the presence of a closely related indigenous species in New Zealand (*A. anserinoides*) suggests an indigenous status for *A. anserina* in Australia, but the major disjunction of the nearest occurrence of *A. anserina* suggests an alien status. While the origin status in Australia is uncertain, I recommend that it be treated as indigenous until such time as molecular markers indicate otherwise.

Although on morphological grounds, I am unable to consistently distinguish the Australian taxon from *Argentina anserina* s. str. from the Northern Hemisphere, its geographic isolation from Northern Hemisphere populations questions whether the Australian taxon may be a separate genetic lineage worthy of taxonomic recognition. *Argentina anserina* has already been shown to be highly variable in chromosome number (Rousi 1965). For these reasons I do not advocate the usage of 'subsp. *anserina*' for Australia. Until a molecular study of the whole species is carried out, the taxonomic status of the Australian taxon will remain unresolved.

Fragaria L., *Sp. Pl.* 494 (1753)

Type: *F. vesca* L., fide Rydberg, *N. Amer. Fl.* 22: 356 (1908).

Mabberley (2002) advocated the reduction of *Fragaria* into *Potentilla*, a course which has been followed by Australian herbaria (APC 2014). His opinion was based partly on the initial study of Eriksson et al. (1998), which used a small data set, and produced some clades that were only weakly supported and tentative. Eriksson et al. (2003) expanded both the number of taxa and the number of gene regions examined. The resulting classification placed *Fragaria* and its allies in a separate well-supported clade (= Rosaceae subtribe *Fragariinae* Torr. & A.Gray), distinct from *Potentilla* s. str. The later studies of Potter et al. (2007), Lundberg et al. (2009), and Dobeš and Paule (2010) have all reinforced this finding.

Duchesnea Sm., on the other hand, is deeply nested within *Potentilla* s. str. (Eriksson et al. 2003).

All of these recent systematic studies have shown that *Fragaria* cannot be subsumed into *Potentilla* without expanding the boundaries of the latter genus to an excessive degree. To maintain monophyly, a merger between *Fragaria* and *Potentilla* would necessitate the sinking of all genera in the subtribe *Fragariinae*, including several other well-known and speciose genera, e.g. *Alchemilla* L., *Aphanes* L., *Sibbaldia* L. and *Drymocallis* Fourr. ex Rydb. This is an option that none of the above authors support. Therefore it is recommended here that *Potentilla* × *ananassa* (Weston) Mabb. and *P. vesca*, naturalised in Australia, be reinstated to *Fragaria*, as outlined below.

Fragaria* × *ananassa (Weston) Duchesne ex Rozier, *Cours Compl. Agric.* 5: 52 (1785)

Fragaria chiloensis var. *ananassa* Weston, *Bot. Univ.* 2: 329 (1771); *Potentilla* × *ananassa* (Weston) Mabb., *Telopea* 9: 796 (2002), syn. nov.

Fragaria vesca L., *Sp. Pl.* 1: 494 (1753)

Potentilla vesca (L.) Scop., *Fl. Carniol.* ed. 2, 1: 363 (1771).

Acknowledgements

I thank the Directors of AD, CANB, NSW and MEL for the loan of specimens, and Helen Vonow (AD) for sending extra specimens for my examination. Will Smith (BRI) provided the illustrations and distribution map. Gordon Guymer and two anonymous referees made helpful comments on earlier drafts of this paper.

References

APC (2014). *'Potentilla'*, in *Australian Plant Census*, IBIS database. Centre for Australian National Biodiversity Research, Council of Heads of Australasian Herbaria. Accessed 30 August 2014. <http://www.anbg.gov.au/chah/apc/index.html>

AVH (2014). *Australia's Virtual Herbarium*, Council of Heads of Australasian Herbaria. Accessed 29 September 2014. <http://avh.chah.org.au>

Baker, M.L. and de Salas, M.F. (2012). A census of the vascular plants of Tasmania, 2012 edition. Tasmanian Herbarium, Tasmanian Museum and Art Gallery: Hobart. Accessed 4 April 2014. <http://www.tmag.tas.gov.au/__data/assets/pdf_file/0008/66797/2012_Census_of_Tasmanian_Vascular_Plants.pdf>

Ball, P.W., Pawlowski, B. and Walters, S.M. (1968). *'Potentilla'*, in T.G. Tutin, V.H. Heywood, N.A. Burges, D.M. Moore, D.H. Valentine , S.M. Walters and D.A. Webb (eds), *Flora Europaea* **2**, 36–47. Cambridge University Press: London.

Barker, B., Barker, R., Jessop, J. and Vonow, H. (eds) (2005). *Census of South Australian vascular plants*, 5th edn. J. Adelaide Bot. Gardens Supplement 1. Botanic Gardens of Adelaide & State Herbarium: Adelaide.

Bean, A.R. (2007). A new system for determining which plant species are indigenous in Australia. *Australian Systematic Botany* **20**, 1–43.

Bentham, G. (1864). *'Potentilla'*, in *Flora Australiensis* **2**, 429. L. Reeve & Co.: London.

Castagnaro, A., Diaz Ricci, J., Arias, M. and Albornoz, P. (1998). A new Southern Hemisphere species of *Potentilla* (Rosaceae). *Novon* **8**, 333–336.

Chaoluan, L., Ikeda, H. and Ohba, H. (2003). *'Potentilla'*, in Z.Y. Wu, P.H. Raven and D.Y. Hong (eds), *Flora of China* **9**, Pittosporaceae through Connaraceae, 291–328. Missouri Botanical Garden Press: St Louis.

Dobeš, C. and Paule, J. (2010). A comprehensive chloroplast DNA-based phylogeny of the genus *Potentilla* (Rosaceae): implications for its geographic origin, phylogeography and generic circumscription. *Molecular Phylogenetics and Evolution* **56**, 156–175.

Eriksson, T., Donoghue, M.J. and Hibbs, M.S. (1998). Phylogenetic analysis of *Potentilla* using DNA sequences of nuclear ribosomal internal transcribed spacer (ITS), and its implications for the classification of Rosoideae (Rosaceae). *Plant Systematics and Evolution* **11**, 155–179.

Eriksson, T., Hibbs, M.S., Yoder, A.D., Delwiche, C.F. and Donoghue, M.J. (2003). The phylogeny of Rosoideae (Rosaceae) based on sequences of the internal transcribed spacers (ITS) of nuclear ribosomal DNA and the *trn*L/F region of chloroplast DNA. *International Journal of Plant Sciences* **164**, 197–211.

Fedorov, A.A., Komarov, V.L., Kostina, K.F., Kovalev, N.V., Krishtofovich, A.N., Linchevskii, I.A., Poyarkova, A.I. and Yuzepchuk, S.V. (1971). *Flora of the U.S.S.R.* **X**, Rosaceae-Rosoideae, Prunoideae (V.L. Komarov, ed.). Israel Program for Scientific Translations: Jerusalem.

Harden, G.J. and Rodd, A.N. (1990). *'Potentilla'*, in G.J. Harden (ed.), *Flora of New South Wales* **1**, 536. New South Wales University Press: Sydney.

IUCN (2012). *IUCN Red List Categories and Criteria*, version 3.1, 2nd edn. International Union for the Conservation of Nature: Gland, Switzerland and Cambridge, UK. Accessed 29 September 2014. <https://portals.iucn.org/library/efiles/documents/RL-2001-001-2nd.pdf>

Jacobs, S.W.L. and Pickard, J. (1981). *Plants in New South Wales*. New South Wales Government Printer: Sydney.

Jeanes, J.A. and Jobson, P.C. (1996). 'Rosaceae', in N.G. Walsh and T.J. Entwisle (eds), *Flora of Victoria* **3**, 556–585. Inkata Press: Melbourne.

Kew Catalogue (2015). *The Herbarium Catalogue*. Royal Botanic Gardens, Kew. Accessed 1 January 2015. <http://www.kew.org/herbcat>

Lundberg, M., Töpel, M., Eriksen, B., Nylander, J.A.A. and Eriksson, T. (2009). Allopolyploidy in Fragariinae (Rosaceae): comparing four DNA sequence regions, with comments on classification. *Molecular Phylogenetics and Evolution* **51**, 269–280.

Mabberley, D.J. (2002). *Potentilla* and *Frogaria* (Rosaceae) reunited. *Telopea* **9**, 793–801.

McGann, T.D., Kingswood, R. and Bell, D. (2001). Vegetation of Narran Lake Nature Reserve, North Western Plains, New South Wales. *Cunninghamia* **7**, 43–63.

Pesman, H. (1972). '*Potentilla*', in P.H. Davis (ed.), *Flora of Turkey* **4**, 41–68. University Press: Edinburgh.

Potter, D., Eriksson, T., Evans, R.C., Oh, S., Smedmark, J.E.E., Morgan, D.R., Kerr, M., Robertson, K.R., Arsenault, M., Dickinson, T.A. and Campbell, C.S. (2007). Phylogeny and classification of Rosaceae. *Plant Systematics and Evolution* **266**, 5–43.

Rousi, A. (1965). Biosystematic studies on the species aggregate *Potentilla anserina* L. *Annales Botanici Fennici* **2**, 47–112.

Rydberg, P.A. (1908). 'Rosaceae', in *North American Flora* **22**, 239–533. New York Botanical Garden: New York.

Shah, M. (2014). '*Potentilla*', Flora of Pakistan online. Accessed 23 December 2014. <http://www.efloras.org/florataxon.aspx?flora_id=5&taxon_id=126635>

Soják, J. (1988). Notes on *Potentilla* (Rosaceae) VII. Some Himalayan taxa. *Candollea* **43**, 437–453.

Soják, J. (1994). Notes on *Potentilla* (Rosaceae) X–XII. X. The section Dumosae. XI. The *P. microphylla* and *P. stenophylla* groups (sect. *Pentophylloides*). XII. Key to the taxa of *P.* sect. *Pentophylloides* (Anserina). *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* **116**, 11–81.

Soják, J. (2004). *Potentilla* L. (Rosaceae) and related genera in the former USSR (identification key, checklist and figures). Notes on *Potentilla* XVI. *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* **125**, 253–340.

Soják, J. (2007). *Potentilla* (Rosaceae) in China. Notes on *Potentilla* XIX. *Harvard Papers in Botany* **12**, 285–323.

Soják, J. (2009). *Potentilla* (Rosaceae) in the former USSR; second part: comments. Notes on *Potentilla* XXIV. *Feddes Repertorium* **120**, 185–217.

Soják, J. (2010). *Argentina* Hill, a genus distinct from *Potentilla* (Rosaceae). *Thaiszia* **20**, 91–97.

Soják, J. (2012). *Potentilla* L. (Rosaceae) and related genera in Asia (excluding the former USSR), Africa and New Guinea – Notes on *Potentilla* XXVIII. *Plant Diversity and Evolution* **130**, 7–157.

The Plant List (2013). *The Plant List*, version 1.1. Accessed 1 January 2015.<http://www.theplantlist.org/>

Walsh, N.G. and Stajsic, V. (2008). *A census of the vascular plants of Victoria*, 8th edn. Royal Botanic Gardens Melbourne: South Yarra. Accessed 6 April 2014. <http://www.rbg.vic.gov.au/viclist/index.htm>